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PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. II. 1847–8. No. 31.

Monday, May 3, 1847.

The following Donations of Books to the Library were announced:—

Memoirs and Proceedings of the Chemical Society. Part 20. 8vo. —*By the Society.*

The American Journal of Science and Arts. Conducted by Professors Silliman and J. D. Dana. For March 1847. 8vo.—*By the Editors.*

On three several Hurricanes of the Atlantic, and their relations to the Northers of Mexico and Central America, with notices of other storms. By W. C. Redfield. 8vo.—*By the Author.*

Proceedings of the American Academy of Arts and Sciences, May 26, 1846. 8vo.—*By the Academy.*

The Fourteenth Annual Report of the Royal Cornwall Polytechnic Society, 1846. 8vo.—*By the Society.*

Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, in the year 1844. Under the direction of George Biddell Airy, Esq., M.A., Astronomer-Royal. 4to. —*By the Royal Society.*

49-2-16-66

BRITISH MUSEUM

SIXTY-FIFTH SESSION.

First Ordinary Meeting, 6th December 1847.

SIR THOMAS MAKDOUGAL BRISBANE, Bart.,
President, in the Chair.

The following Communications were read:—

1. Biographical Memoir of the late Dr Hope. By Dr Traill.

2. Note on the Constitution of the Phosphates of the Organic Alkalies. By Dr Thomas Anderson.

The author had been led to investigate the phosphates of the organic alkalies, with the view of determining the accuracy of an analysis of the phosphate of strychnia by Regnault, which gave results incompatible with the known constitution of the inorganic phosphates. He alluded to the investigation of the phosphates of aniline by Nicholson, and proceeded to the statement of his own observations.

Phosphate of Strychnia, with one equivalent of Strychnia, was obtained in long truncated needles, by digesting strychnia in tribasic phosphoric acid. It dissolved readily in water, and was acid to test-paper. By analysis it gave results corresponding to the formula

$$(C_{44}\,H_{23}\,N_2\,O_4\,HO)\;2\,HO\;PO_5$$

The crystallized salt was found to contain 4 equivalents of water of crystalization.

Phosphate of Strychnia, with two equivalents of Strychnia. By long-continued digestion of strychnia with the foregoing water in solution, an additional atom of the alkaloid is dissolved, and the solution on cooling deposits rectangular tables of a salt which is neutral to test-paper. It is less soluble in water than the acid phosphate, and its constitution was found to be represented by the formula

$$2\,(C_{44}\,H_{23}\,N_2\,O_4\,HO)\;HO\;PO_5$$

Phosphate of Brucia, with two equivalents of Brucia, is obtained by the solution of Brucia in phosphoric acid, and crystallizes from the concentrated solution in short prisms. The crystals are neutral to test-paper, and contain a large quantity of water of crystallization, which they lose by efflorescence. The formula of the salt is

$$2\,(C_{44}\;H_{23}\,N_2\,O_7\,HO)\;HO\;PO_5$$

A double phosphate of Brucia and soda was also formed, but could not be obtained perfectly pure.

Phosphate of Quinine, with three equivalents of Quinine. By digesting quinine with phosphoric acid, a solution of this salt is obtained, which becomes a solid mass of silky needles on cooling. They are extremely soluble in hot water, and are quite neutral to test-paper. They gave, by analysis, a result corresponding with

$$3\,(C_{20}\,H_{12}\,NO_2\,HO)\,PO_5$$

These results the author considered sufficient to establish the fact, that the phosphate of the organic alkalies agree in their constitution with the inorganic salts of that acid ; and he concluded his paper by observing, that the relations of these bases to phosphoric acid might be made use of as a means of classifying them. Thus quinine, which replaces three equivalents of water in phosphoric acid, might be compared to oxide of lead and the oxides of the heavy metals. Brucia might represent the inorganic alkalies. While strychnia, which, under ordinary circumstances, replaces only one equivalent of water, belongs to a class which has no analogue among the series of inorganic bases.

The following Donations to the Library were announced:

Annals of the Lyceum of Natural History of New York. Vol. IV., No. 67. 8vo.—*By the Society.*

Address delivered at the Anniversary Meeting of the Geological Society of London, on the 19th February 1847. By Leonard Horner, V.P.R.S., President of the Society. 8vo.—*By the Author.*

Proceedings of the American Philosophical Society. Vol. IV., No. 34. 8vo.

Transactions of the American Philosophical Society, held at Philadelphia, for Promoting Useful Knowledge. Vol. IX., Part 3. —*By the Society.*

A Treatise on Atmospheric Phenomena. By Edward Joseph Lowe, Esq., 8vo.—*By the Author.*

Annales de l'Observatoire Royal de Bruxelles. Tom. V.—*By M. A. Quetelet.*

Mémoires Couronnés et Mémoires des Savants Etrangers, par l'Académie Royale de Bruxelles. Tom. IX., 1845 et 1846 ; Tom. XX., 1846, 2 Parties ; Tom. XXI., 1846. 4to.—*By the Academy.*

Nouveaux Mémoires de l'Académie Royale des Sciences et Belles Lettres de Bruxelles. Tom. XIX. 4to.—*By the Academy.*

Mémoires de l'Académie Royale des Sciences, des Lettres, et des Beaux Arts de Belgique. Tom. XX. 8vo.—*By the Academy.*

Bulletin de l'Académie Royale des Sciences, des Lettres, et des Beaux Arts de Belgique. Tom. XIII. (complète) et Tom. XIV., Nos. 1, 2, 3, 4, 5, 6. 8vo.—*By the Academy.*

Bulletin de la Commission Centrale de Satistique de Belgique. Ext. de Tom. III., sur les Anciens Recensements de la Population Belge, par M. Quetelet; et la même livraison, De l'Influence du Libre Arbitre de l'Homme sur les Faits Sociaux. Par M. A. Quetelet. 8vo.—*By the Author.*

Bulletin de la Société Impériale des Naturalistes de Moscou. Nos. 3, 4 (1846); No. 1 (1847). 8vo.

Séance Extraordinaire de la même Société, du 22 Février 1847. 8vo. —*By the Society.*

Berichte Über die Mittheilungen von Freunden der Naturwissenschaften in Wien. Von W. Haidinger. Band I., Nos. 1—6, und Subscriptions Liste. 8vo.—*By the Author.*

Bulletin der Königl. Akademie der Wissenschaften zu Berlin. Nos. 1–77. 8vo.—*By the Academy.*

Gelehrte Anzeigen, von der Akademie der Wissenschaften zu Berlin. Bde. 16–23. 8vo.—*By the Academy.*

Abhandlungen der Mathematisch-Physikalischen Classe der Königl. Bayerischen Akademie der Wissenschaften. 4 Band. 3 Abtheilung. 4to.—*By the Academy.*

Über das Studium der Griechischen und Römischen Alterthümer. Von Ernest von Lasaulx.—*By the Author.*

Über die Ordealien bei den Germanen in ihrem Zusammenhange mit der Religion. Von Georg Phillips. 8vo.—*By the Author.*

Die Überbleibsel der Altægyptischen Menschenrace. Von Dr Franz Pruner. 8vo.—*By the Author.*

Almanach der Akademie der Wissenschaften zu Göttingen, für 1847. 8vo.—*By the Academy.*

Annuaire de l'Académie Royale de Belgique, 1846 & 1847. 8vo.—*By the Academy.*

Annuaire de l'Observatoire Royale de Bruxelles. Par M. Quetelet. 1847.—*By the Author.*

Journal of Agriculture, and Transactions of the Highland and Agricultural Society of Scotland. No. 17 (July) and No. 18 (October) 1847. 8vo.—*By the Society.*

Journal of the Statistical Society of London. Vol. X., Part 3. 8vo. —*By the Society.*

Quarterly Journal of the Geological Society. No. 2 (August). 8vo. —*By the Society.*

Monthly Journal of Medical Science. No. 81 (September). 8vo. —*By the Editor.*

Thirteenth Annual Report of the Royal Cornwall Polytechnic Society. 8vo.—*By the Society.*

Journal of the Royal Asiatic Society. Vol. X., Parts 2 and 3. 8vo. —*By the Society.*

Journal of the Asiatic Society of Bengal. Edited by the Secretary. Nos. 171, 172, 173. 1846. 8vo.—*By the Editor.*

Do. do. Edited by the Secretaries. New Series. Nos. 174, 175, 176, and 181; with Supplementary Number published January 1847. 8vo.—*By the Editors.*

American Journal of Science and Arts. Conducted by Professors Silliman and Dana. Second Series. Nos. 5, 8, 9, 10, 11. 8vo.—*By the Editors.*

Philosophical Transactions of the Royal Society of London. Part 1, 1847. 4to.—*By the Society.*

Kongelike Dånske Videnskabernes Selskabs Naturvidenskabelige og Mathematiske Afhandlinger. Tolvte Deel. 4to.—*By the Royal Society of Sciences of Copenhagen.*

Flora Batava. No. 147. 4to.—*By the King of the Netherlands.*

Handbuch der Mineralogie. Von J. F. L. Hausmann. 2 Theil. 8vo.—*By the Author.*

Astronomische Beobachtungen der Königl. Universitäts-Sternwarte in Königsberg. Von F. W. Bessel. 19 and 21 Abtheilung. Fol.—*By the Author.*

Annales de la Société Royale d'Agriculture de Lyon. Tom. VIII. 1845.—*By the Society.*

Recherches sur les Mouvements de la Planête Herschel. Par M. Le Verrier. 1846.—*By the Author.*

Ankuendigung und Probe einer Neuen Kritischen Ausgabe, und Neuen Uebersetzung der Syrischen Chronik, des Gregor Bar-Hebraeus. Von G. H. Bernstein. 1847. 8vo.—*By the Author.*

Sur la Publication des Monuments de la Géographie. 8vo.—*By the Author.*

Satistique Générale. Rapport au Ministre de l'Intérieur sur les Travaux de la Commission Centrale, et des Commissions Provinciales de Satistique.—*By M. A. Quetelet.*

Rapport sur les Travaux de l'Académie Royale des Sciences et Belles Lettres de Bruxelles, pendant l'année 1842–43. Par A. Quetelet. 8vo.—*By the Author.*

Rapport sur les Travaux et les Titres Scientifiques de M. Duponchel, lu à la Société des Enfants du Nord. 2 copies. 8vo.—*By the Society.*

Bulletin des Séances de la Société Vaudoise des Sciences Naturelles. Nos. 14 & 15. 8vo.—*By the Society.*

Censura Commentationum Soc. Reg. Danicæ Scientiarum, anno 1846, ad præmium reportandum oblatarum.—*By the Society.*

Öfversigt över det Kongelike Dånske Videnskabernes Selskabs Forhandlinger, og dets Medlemmers Arbeider i Aaret, 1846, af H. C. Örsted. 8vo.—*By the Author.*

On the Nucleus of the Animal and Vegetable " Cell." By Martin Barry, M.D. 8vo.—*By the Author.*

Memoirs and Proceedings of the Chemical Society. Part 21. 8vo. —*By the Society.*

On the Origin of Continents. By James D. Dana. 8vo.

Origin of the Grand Outline Features of the Earth. By James D. Dana. 8vo.—*By the Author.*

Greenwich Astronomical Observations. 1845. 4to.—*By the Royal Society.*

Medico-Chirurgical Transactions. Vol. XIII. 8vo.—*By the Editor.*

Everest's Measurement of the Meridional Arc of India. With Plates. 4to.—*By the Directors of the East India Company.*

Results of Astronomical Observations at the Cape of Good Hope. By Sir J. F. W. Herschel, Baronet. 8vo.—*By the Duke of Northumberland.*

Researches for a Remedy against Communism. By Baron Dersenyis. 8vo.—*By the Author.*

Turner's Chemistry. 8th Edition. By Liebig and Gregory. 8vo. —*By the Editors.*

Description and Conquest of Ceylon. By Henry Marshall. 8vo. —*By the Author.*

Elements of General and Pathological Anatomy. Second Edition. By David Craigie, M.D. 8vo.—*By the Author.*

Observations on the Famine of 1846–7 in the Highlands of Scotland and in Ireland. By W. P. Alison, M.D. 8vo.—*By the Author.*

The Acts of the Parliaments of Scotland. Vol. I. (1124–1423.) Fol.

Acta Dominorum Concilii. Oct. 5, 1478 ad Nov. 15, 1495. Fol.

Acta Dominorum Auditorum. Oct. 9, 1466 ad Dec. 16, 1494. Fol.—*By the Lords Commissioners of the Treasury.*

Proceedings of the Royal Society. No. 67, 1846, and No. 68, 1847. 8vo.—*By the Society.*

Memorie della Reale Academia delle Scienze di Torino. Ser Seconda. Tom. III., IV., V., VI. 4to.—*By the Academy.*

Memoirs and Proceedings of the Chemical Society. Part 22. 4to. —*By the Society.*

Journal of the Statistical Society of London. Vol. X., Part 4. 8vo. —*By the Society.*

Observations on the Temple of Serapis. By Ch. Babbage. 8vo.—*By the Author.*

Bulletin de la Société de Géographie. 3ième Série, Tom. VII. 8vo. —*By the Society.*

Etudes d'Astronomie Stellaire. Par M. Struve. 1847. 8vo.—*By the Author.*

Die Cephalopoden des Salzkammergutes, aus der Sammlung Seiner Durchlaucht Fürsten Von Metternich. Von F. R. Von Hauer. 4to.—*By Prince Metternich.*

Journal of the Asiatic Society of Bengal. Nos. 178 and 179, for May and June 1847; and Index to Vol. XV. 8vo.—*By the Society.*

Proceedings of the Zoological Society of London. Nos. 155, 177. 8vo.

Reports of Council and Auditors of the Zoological Society of London, for April 1847. 8vo.

A List of the Fellows, &c., of the Zoological Society of London, for April 1847.

Transactions of the Zoological Society of London. Vol. III., Part 4.—*By the Society.*

A large Collection of the Admiralty Charts of Great Britain.—*By the Lords Commissioners of the Admiralty.*

Monday, 20*th December* 1847.

RIGHT REV. BISHOP TERROT, V.P., in the Chair.

The following communication was read:

Examination of some Theories of German Writers, and of Mr Grote, on the Authorship of the Iliad and Odyssey.

By Professor Dunbar.

In the first part of the paper the question was examined, whether the art of writing was known and practised at the time in which Homer is supposed to have lived? It was found that there was no evidence, either in the Iliad or Odyssey, that it was practised at that time; but that these poems must have been transmitted orally by the Bards for a period of nearly three centuries. It was then considered whether poems of such a length as the Iliad and Odyssey could have been composed and committed to memory by one man; and it was shewn, from several examples, that there was no impossibility in the matter. Mr Grote's theory, "that no such poet of the name of Homer ever existed," was then examined, and shewn, from the testimony of several of the most eminent Greek authors, to be fallacious. It was stated that lays, containing the history of the ancestors of powerful chiefs, were composed by the Bards attached to their families, and that Homer, in all probability, availed himself of them in working up the Iliad and Odyssey. The mode in which these poems were circulated through Greece by the Nomads, was next pointed out, by their reciting them on public occasions in every part of Greece. It was shewn that they were not committed to writing till a little before the age of Solon and Pisistratus. Wolfe and Lachmann's theories were then examined, and shewn to be altogether fallacious. The opinion of Mr Grote that the Iliad was first an Achilleis, and that the books, including the second and the subsequent ones to the eleventh, were the compositions of a later or later poets, was examined, and it was shewn, by a reference to several incidents in these books, that they must have been composed by the same author, and formed a necessary part of the story of the Iliad. It was stated, contrary to Mr Grote's opinion, that the Iliad possessed more unity than the Odyssey, and that internal evidence proved that it was in all probability composed by the author of the Iliad, and not by a piecing together of the lays of later poets. The opinions of some German critics, that the Odyssey was of a later date than the Iliad, was then examined, and shewn to be well founded. It seemed likely to have been composed in Homer's old age, and bore the same resemblance to the Iliad in point of execution as the Paradise Regained of Milton to that of the Paradise Lost of the same poet. The paper concluded with a quotation from Mr Grote, in which he seemed to have departed from his original opinions.

The following Gentlemen were duly elected Ordinary Fellows:

John Wilson, Esq., F.G.S.
Moses Steven, Esq.

The following Donations to the Library were announced:—

Emploi de l'Airain à défaut du Fer chez la plupart des peuples des cinq parties du monde, &c. Notice intéressant les Peintres d'Histoire et les Archéologiques, Extraite du livre intitulé, Déconvertes dans la Troade. Par A. F. Mauduit. 3 copies. 8vo.—*By the Author.*

Défense de feu Le Chevalier, et du feu Comte de Choiseul Gouffier contre M. P. B. Webb. Par M. Mauduit. 4 copies.—*By the Author.*

Appendices du livre Découvertes dans la Troade, publié en 1840 par M. Mauduit; Défense de Le Chevalier et du Comte Choiseul Gouffier, &c. 4to.—*By the Author.*

Verhandlungen der Schweizerischen Naturforschenden Gesellschaft bei ihrer Versammlung zu Chur. 1844. 4to.—*By the Society.*

Actes de la Société Helvétique des Sciences Naturelles. Trentième Session. 4to.—*By the Society.*

Journal of the Asiatic Society of Bengal; Edited by the Secretaries. September, No. 182. 8vo.—*By the Society.*

Scheikundige Onderzœckingen, gedaan in het Laboratorium der Utrechtsche Hooge-school. 4de Deel, 4de Stuk. 4to.—*By the University.*

Mittheilungen der Naturforschenden Gesellschaft in Bern, aus dem Jahre, 1844–46. Nos. 13–38, 57–86.—*By the Society.*

Bulletin de la Société des Sciences Naturelles de Neuchatel. 1844–45–46. Tom. 1. 8vo.—*By the Society.*

Mémoires de la Société des Sciences Naturelles de Neuchatel. Tom. I., II., III. 4to.—*By the Society.*

Abhandlungen der Königl. Akademie der Wissenschaften zu Berlin, aus dem Jahre 1845. 4to.—*By the Academy.*

Bericht über die zur Bekanntmachung geeigneten Verhandlungen der Königl., Preuss. Akademie der Wissenschaften zu Berlin. Juli—December 1846, und Januar—Juni 1847. 4to.—*By the Academy.*

Bemerkungen über Gyps und Karstenit, von J. F. L. Hausmann. 4to.—*By the Author.*

Nachrichten von der Georg-Augusts-Universität und der Königl. Gesellschaft der Wissenschaften zu Göttingen. 1846.—*By the Society.*

Tradescant der Aeltere 1618 in Russland. Von Dr J. Hamel. 4to.—*By the Author.*

Annuaire Magnétique et Météorologique du Corps des Ingénieurs des Mines de Russie, ou Recueil d'Observations Magnétiques et Météorologiques, par A. T. Kupffer. Année 1844. Nos. 1 & 2.—*By the Editor.*

An Engraving of the late Principal Robertson.—*By John Russell, Esq.*

Monday, 3d *January* 1848.

RIGHT REV. BISHOP TERROT, V.P., in the Chair.

The following communication was read:—

1. On Algebraical Symbolism. By Bishop Terrot.

The author commenced by proving the propriety of the adoption of the minus sign for quantities of an affection opposite to those affected by the plus sign, and detecting the limits within which this use of the absolute minus was reasonable and effective.

He observed that this was merely a particular case of the notation which symbolizes the inclination of lines by the factor $1^{\frac{\delta}{2\pi}}$, namely, the case where $\delta = 180°$, and proceeded to shew within what limits the algebraical rules for the treatment of exponential quantities are applicable to the symbols of inclined lines.

After referring to the use of this notation in all the problems of plane Trigonometry, especially those which treat of the sines and cosines of multiple arcs, he gave some examples of its applicability to some elementary propositions in the first and fourth books of Euclid.

The following Donations to the Library were announced:—

The American Journal of Science and Arts, conducted by Professors Silliman and Dana. Vol. IV., No. 12. November, 1847. 8vo.—*By the Editors.*

The Journal of Agriculture. N. S., No. 19. January, 1848. 8vo. —*By the Publishers.*

On certain Laws of Cohesive Attraction. By James D. Dana. 8vo.

A General Review of the Geological Effects of the Earth's Cooling from a State of Igneous Fusion. By James D. Dana. 8vo.

Conspectus Crustaceorum. Auctore Jacobo D. Dana. 8vo.—*By the Author.*

Leeds Philosophical and Literary Society. Annual Report. 1846-7. 8vo.—*By the Society.*

The Mathematical Analysis of Logic. By George Boole. 8vo.—*By the Author.*

Königl. Vetenskaps Handlingar, för Ar 1845. Hft. 1 & 2. Stockholm, 1847. 8vo.—*By the Academy.*

Öfversigt af Königl. Vetenskaps-Akademiens Förhandlingar. 1846. Nos. 7–10. 1847. Nos. 1-6. Stockholm. 8vo.—*By the Academy.*

Årsberättelse om Zoologiens Framsteg under Åren 1843–44. Af C. J. Sunderall. Stockholm, 1846. 8vo.—*By the Editor.*

Tal Hället vid Praes. Nedläggande uti Königl. Vetenskaps-Akademien, den 7 April 1841. Af N. G. Sefström. Stockholm, 1846. 8vo.—*By the Editor.*

Berättelse om Framstegen i Fysik, ären 1843 and 1844, afgiven till Königl. Vetenskaps-Akademien, af A. F. Svanbergoch, och P. A. Siljeström. Stockholm, 1847. 8vo.—*By the Editors.*

Memoirs of the Royal Astronomical Society. Vol. XVI. 4to.

Proceedings of the Royal Astronomical Society. Vol. VII., Nos. 1–17. 8vo.—*By the Society.*

Monthly Journal of Medical Science, No 85. January, 1848. 8vo. —*By the Editors.*

Monday, 17th January 1848.

Dr CHRISTISON, Vice-President, in the Chair.

The following Communications were read:—

1. Account of a Geological Examination of the Volcanoes of the Vivarais. By Professor Forbes.

The author having, on former occasions, stated some results of his travels in Auvergne and the Cantal, gives a more detailed description of the volcanoes of the Vivarais, which have been less frequently and less accurately described.

He first gives an account of the journey from Le Puy across the chain of the Cevennes which culminate at the volcanic summit of the Mezeuc, by the course of the Loire, to Montpezat in the department of the Ardêche.

The best descriptions of the Vivarais are those of Foujas de St Fond and Mr Scrope. The plates illustrating the work of the latter leave almost nothing to desire. These authors have described more or less fully the following volcanic orifices—Coupe de Jaujac, Souillolsor Neyvac, Mouleynes or Thuez; Montpezat and Aysac. Other writers have described the cone of Bauzou, and the (so-called) crater of Elevation of Pal, which are generally supposed not to have given birth to any lava stream. The present author has given a more minute and detailed account of each of these volcanoes, and of the great beds of basaltic lava to which they have respectively given birth. He discusses the relative age, the remarkably columnar structure, and the surprising erosion by water of these (comparatively modern) lava flows, which he illustrates by an exact map of the formations, based upon Cassini's, and by very numerous levels barometrically determined. He has also been able to add to the list of known volcanoes in this district, two craters which he believes never to have been described, occurring in remarkable positions, and giving rise to extensive lava streams, one in the valley of Budzet, the other in that of la Bastide. The former he believes to be unparalleled amongst ancient or modern lavas for the length and slenderness of its stream, shewing a surprising liquidity, which he illustrated by some experiments on the powers of melted iron solidifying in narrow channels.

A series of specimens illustrating the paper had formerly been presented to the Society.

2. Geological Notices. By Dr Fleming.

(1.) *Additional example of Diluvial Scratches on the Rocks in the neighbourhood of Edinburgh.*

The author stated that, recently, an opportunity had presented itself of observing, at a newly-opened sandstone quarry, *dressed and scratched surfaces*, at an elevation above the level of the sea greater than any examples of the same kind of diluvial action as yet recorded, as occurring in the neighbourhood. The locality is eastward of the east Cairn Hill, in the Pentland Hills, at a place termed "Thomson's Walls," and its elevation, according to Knox's map of Mid-Lothian, is 1400 feet.

Dr Fleming then stated, that, last autumn, in addition to the example of a dressed and scratched surface 130 yards westward of Granton Pier, *on a level with the beach*, he had observed a similar occurrence at the east side of the harbour of North Berwick, near the "Auld Kirk," on the surface of a rock of amygdaloid; and added, that he had found similar scratches, at the sea-level, on the south side of Montrose Basin.

The author next adverted to an example of dressed vertical surfaces, with *horizontal* scratches, on the northern base of North Berwick-Law. He likewise referred to the horizontal scratches on a vertical face of rock recently exposed at the Hadderwick Lime Quarries, north from Montrose.

Dr Fleming next called the attention of the Society to the Blackford Hill example of a dressed and scratched surface, and intimated that the scratches had a dip to the eastward, reaching, in some cases, to 50°. He stated it as probable, that the phenomena, instead of having resulted from diluvial action, had been produced by the abrading operations of the Braid Burn.

Verbal Notice.

(2.) *On the Fluor-Spar of Aden.*

Dr Fleming exhibited to the Society several beautiful examples of quartz and calcedony, in the form of cakes or circumscribed stalagmites, from the fort of Aden in the Red Sea, which had been sent to him by Dr Buist of Bombay. They were remarkable as having a few minute crystals of fluoride of calcium, the matter of which aggregated during the evaporation of the water, which had furnished, in greater quantity, the siliceous materials forming the support.

The following Gentleman was duly elected an Ordinary Fellow :—

James Tod, Esq., W.S.

The following Donations to the Library were announced :—

Ordnance Survey. Account of the Measurement of the Lough Foyle Base in Ireland. By Capt. William Yolland. 4to.—*By the Honourable Board of Ordnance.*

Natural History of New York. Botany. By John Torrey. Vol. I., Part 2. Vol. II., Part 2. 4to.

Do Do. Agriculture. By E. Emons. Part 5. 4to. —*By the State of New York.*

Flora Batava. Parts 148 and 149. 4to.—*By the King of the Netherlands.*

Journal of the Asiatic Society of Bengal, No. 183. October, 1847. 8vo.—*By the Secretaries.*

A Collection of Fossil Plants from the Newcastle Coalfield.—*By Sir G. S. Mackenzie, Bart.*

Monday, 7th February 1848.

Sir THOMAS MAKDOUGAL BRISBANE, Bart.,
President, in the Chair.

The following Communication was read :—

1. On the Preparation of Kreatine, and on the amount of it in the flesh of different Animals. By Dr Gregory.

After some remarks on the present state of animal chemistry, the author commenced by giving a brief account of the recent discoveries of Liebig in regard to the constituents of the "juice of flesh," or the liquid contained in the substance of the muscles, which is distinguished from the blood by the large proportion of free acid it contains. This remarkable animal fluid has been found, by Liebig, to contain phosphoric and lactic acids in large quantity, inosinic acid in small proportion, and some other acids not yet studied; also, potash in large quantity with a little soda, a considerable proportion of magnesia, and a little lime, chloride of potassium, with a little chloride of sodium, and, besides some compounds of animal origin not yet investigated, the new base Kreatinine, and the very remarkable substance, Kreatine, first discovered by Chevreul, but in vain sought for by Berzelius and other chemists.

He then described the process, essentially that of Liebig, by which kreatine is extracted from the flesh of quadrupeds, birds, and fishes, in all of which hitherto tried, it has been found, although in small and variable quantity. A table was exhibited, shewing the percentage obtained from different kinds of flesh and fish, and the result was, that this interesting substance may be most easily and cheaply prepared from fish, especially cod, herring, salmon, and mackerel, all of which yielded much more than beef or horse-flesh, and nearly as much as fowl, which was the most productive. The maximum proportion of kreatine was 3·2 per 1000 parts of flesh. The average about 1·5 per 1000.

The author stated that he had found inosinic acid only in the flesh of fowl and turkey; and he is informed, by Baron Liebig, that it is quite possible that this acid may also have been confined to the flesh of fowls in his experiments, as it was often absent, although he cannot now ascertain the cases in which it was present.

He concluded by stating, that as kreatine is found in the urine, along with kreatinine, it appears to be, in part at least, a substance intended for excretion. Its crystalline character renders this probable; and, at all events, if it has any function to perform in the body, that function is not yet known. It must be regarded, in the mean time, as one of the numerous series of less complex products derived from the decomposition, in the body, of the effete tissues; and although we cannot yet produce it artificially, yet, from the rapid progress recently made in the study of the products of decomposition of the albuminous substances, we may hope soon, not only to do this, but also to discover, from these products, the true formulæ of the albuminous compounds.

2. Notices of a Flood at Frastanz, in the Vorarlberg, in the Autumn of 1846. By William Brown, Esq.

The author noticed the general effects of running water, in dissolving, rubbing down, and transporting to a lower level, the solid parts of the earth's surface; and referred to the gradual change which it is producing on the relative level of sea and land. He then described an occurrence which he had witnessed in the Vorarlberg, during the autumn of 1846.

After a hot and dry summer, a succession of heavy rains for nearly a fortnight, swelled all the streams flowing into the river Ill, flooded the lower grounds, and inflicted a great deal of injury on the fields, roads, and bridges. At Frastanz, a small stream brought down from the mountains an enormous quantity of gravel, which continued for at least three weeks after the rains had ceased. When first seen by him, on the 6th of September, the volume of water in the stream was not very great, nor was its velocity unusual; but immediately beneath the surface of the water, which was quite transparent, innumerable stones were seen to be in motion. These stones were generally of the size of an egg. The quantity of gravel brought down was so great, that the bed of the stream was elevated to the height of 25 feet in one part. The village of Frastanz was considered to be in danger, from this curious torrent of stones rolled along by the water; and several hundreds of men were employed to bank it in by large trees laid lengthwise, and supported by strong posts driven into the ground. In the course of the following year, a wooden canal was formed in the lowest part of the stream, by which about a third of the mass of gravel has been washed down. This has raised the level of the Ill, into which the Frastanz stream flows, for two or three miles. The quantity of loose stones in the upper part of the ravine is still so great as to threaten a renewal of the catastrophe at any time when an unusual flow of water shall set it in motion.

3. Contributions to the Phenomena of the Zodiacal Light. By Professor C. Piazzi Smyth.

The purport of this paper was to place on record certain observations made during the years 1843–4–5, in the southern hemisphere, at those times of the year when the Zodiacal Light cannot be seen in the Northern hemisphere; to test, by means of these new data,—which, besides the novelty of the geographical position, had the further one of being determined by instrumental measurement,—what laws of the phenomena may be considered to have been satisfactorily made out, and what required further elucidation; and to recommend these latter to the attention of observers situated in more favourable parts of the world than those commanded by European Observatories generally.

After discussing the history of the subject, and mentioning the results arrived at by different observers, the author mentions the manner in which his attention was first particularly directed to the subject, describes the particular course of observation which he then commenced, and which consisted principally in observing the right ascension and declination of the apex of the light, by means of a small equatorial instrument of particular construction, which gave results not affected with more than 2° of probable error. Combining his own observations with those of former investigators, the author concludes, that the hypothesis proposed by Cassini, and subsequently maintained by La Place, Schubert, Poisson, Biot, and Humboldt, viz., that the Zodiacal light is in the form of a ring encircling the sun, is decidedly untenable, but that it is rather, as first suggested by Mairan and since affirmed by Olbers and Sir John Herschel, in the form of a lenticular mass. Mairan's idea, too, of the body being excentrically disposed about the sun, being endued with a rotation, and occasionally crossing the earth's orbit, seems to be confirmed. But the exact quantity of such excentricity, the period of rotation, the position of the plane of the body, the question of any actual periodical increase in the size and brightness of the Zodiacal light, and the physical nature of that light, whether entirely reflected, or whether, as rendered probable by some observations, partly direct, are matters, for the satisfactory determination of which more data are required. For the assistance of those who may be inclined to prosecute the inquiry, the author adds descriptions, both verbal and pictorial, of what the Zodiacal light is like, what observers may expect to see; and mentions the times of the year at which, in different latitudes, the phenomenon may be best seen, together with a number of other attendant circumstances which are necessary to be complied with, in order to procure undeniable observations.

The following Donations to the Library were announced:—

Observations made at the Magnetical and Meteorological Observatory at St Helena. Vol. I. 1840–43. 4to.—*By H. M. Government.*

Fusinieri (A.) sulle Ipotesi del Signor Melloni circa il Calore Raggiante. 4to.—*By the Author.*

Astronomical Observations made at the Royal Observatory, Edinburgh. By the late Thomas Henderson. Reduced and Edited by C. P. Smyth. Vol. VII. for 1841. 4to.—*By the Royal Observatory.*

Fellenberg (L. R. de), Fragmens de Recherches comparées sur la Nature constitutive de différentes sortes de Fibrine du Cheval dans l'état Normal et Pathologique. 8vo.

—— Analyse de l'Eau Minérale de Weissenburg. 8vo.

——Ueber die bei der Consolidation des Faserstoffes stattfindenden Veränderungen der elementar-analytischen Bestandtheile desselben. 8vo.—*By the Author.*

Bulletin des Séances de la Société Vaudoise des Sciences Naturelles. No 13. 8vo.—*By the Society.*

Journal of the Royal Geographical Society of London. Vol. XVII., Part 2. 1847. 8vo.—*By the Society.*

The London University Calendar for 1848. 12mo.—*By the University.*

Acta Academiæ Cæsareæ Leopoldino-Carolinæ Naturæ Curiosorum. Vol. XXI., Pars 2. 4to.—*By the Academy.*

Monday, 21st February 1848.

Right Rev. BISHOP TERROT, V.P., in the Chair.

The following Communications were read:—

1. Practical Illustration of the Adjustments of the Equatorial Instrument. By Professor C. Piazzi Smyth.

The object of this paper was partly to introduce to the notice of travellers and residents in tropical countries, a small equatorial instrument, specially contrived for observing the Zodiacal light; and partly to bring forward before amateur astronomers, prominently, the advantage of equatorial mountings in general; as well as to exemplify the best and easiest methods of adjusting and rectifying the instruments, and placing the telescopes in every respect in the most favourable circumstances for yielding good results. After describing how, in the history of astronomy, equatorial or parallactic stands were twice taken up and abandoned again, from the erroneous estimate formed of the purposes to which they were adapted, the author mentioned the impracticable nature of the altitude and azimuth mountings which followed; and dated the present era of the perfection and the rational employment of equatorials to have commenced in 1820, when Sir J. Herschel, in conjunction with Sir J. South, erected one of these instruments, to give, by its A. R. and Declination circles, absolute places roughly; and, by means of a micrometer applied to the focus of the telescope, small differences very exactly: the old error having been, to attempt to determine absolute places with the utmost precision.

After particularising the various merits and imperfections of the two grand divisions of equatorials, viz., the English and the German, and mentioning a new construction in progress for the Edinburgh Observatory, combining with the single-pier and short polar axis of the German form, the advantage which the English possesses, of large circles, and a position for the telescope *between* the two bearing ends of the polar axis, together with an exceeding degree of firmness and stiffness,—the author proceeded to describe the six errors of adjustment to which all equatorials are subject, and to shew, by means of a model placed within a representation of the celestial sphere, contrived for the purpose, how all the rectifications might be made by means of observations of stars.

The application of clock motion to equatorials, for the purpose of keeping a celestial object stationary in the field, was next entered into; and the plan explained by which the hitherto ungovernable fits of "knocking" of the revolving balls in the later form of English clocks, has been remedied in the case of the Edinburgh Equatorial;—viz., by having *three* pendulum-balls 120° *apart*, attached to the vertical spindle of the governor, instead of only *two* at 180°.

As a proper micrometer to be used for very faint objects, in place of the ring micrometer,—which the author unhesitatingly condemned, as never having furnished accurate results either in A. R. or Decl., but more especially in the latter, in any person's hands, though so strongly recommended, and extensively used, on account of the beauty and truth of one of the theoretical principles involved in it,—he recommended a bar-micrometer, wherein right ascensions were measured by transits across three parallel bars, marking both the immersions and emersions, so as to get rid of error of focus and irradiation of light; and declinations were measured by a bar at right angles to the former, the objects being bisected alternately with either edge of the bar. Observers already provided with position-micrometers might easily have some of these bars inserted, which in one position might be used for A. R., and in another for Decl. Such a micrometer has been found to require no illumination on the darkest nights, even in telescopes of small aperture, and to produce results, with the amorphous masses of faint comets, almost equal in accuracy to those obtained from stars observed with fine wires in an illuminated field.

The paper concluded with a short special description of the Zod. Light-equatorial, which, for economy, lightness, and general effectiveness, seemed well fitted for scientific travellers.

2. On the Vertebral Column, and some Characters that have been overlooked in the Descriptions both of the Anatomist and Zoologist. By Dr Macdonald.

After noticing that the vertebral skeleton has usually been compared to a column, of which the basis (in man) is formed by the sacrum and coccyx, the shaft or columnar part being the bodies of the true vertebræ, as they are usually styled, and surmounted by the splendid composite capital the cranium, the author proposed restricting the observations to the columnar portion, usually divided into 7 cervical, 12 dorsal, and 5 lumbar vertebræ. This division was denounced, and beginning at the summit, he shewed that the upper or cervical region consisted only of 6 vertebræ, as the 7th, in its normal position in the mammal class, had a rib partly articulated to its body, and therefore acquired the character of a dorsal vertebra.

Restricting the cervical to six, the arrangement of the atlas and axis indicates the tendency to a combination into pairs in the course of the vertebral axis. The body of the atlas is almost entirely replaced by the intrusion of the odontoid process of the axis; and thus, by their combined form and articulations, the head resting on them is provided with an equatorial and azimuth motion, as the astronomers say. The pairing of the 1st and 2d osteologically, is further strengthened neurologically, which is also applicable to the next pair of the 3d and 4th. These two pairs are more properly to be considered as the acostal cephalic portion, as the cervical plexus is principally distributed to the upper region of the body, as far as the motosensory part of the system is concerned, although it also contributes to the thoracic and abdominal portions of the nutrient or splanchnic system. The third pair, formed by the 5th and 6th cervical vertebræ, are the acostal constituents of the humero-brachial regions, and with the 7th, 8th, 9th, and 10th, are neurologically connected together in supporting the nerves, forming the brachial plexus as they emerge from the spinal canal. This arrangement completes the cervical region in all the mammals except the *Bradipus tridactylitis;* which is also illustrative of the coupling or pair principle here proposed, as the additional vertebræ only form another pair. The idea of the different classes of vertebræ composing the cervical region, as proposed by De Blainville and Knox, was examined, and shewn to be incomplete, as it considered the 7th vertebra to be a class by itself. As De Blainville's view coincided with that now submitted, in separating the 7th from the upper vertebræ, it was *pro tanto* adduced in evidence; but the most striking corroboration was found in the examination of the skeletons of many of the mammals, several of which were exhibited and demonstrated, where it was shewn that in many, if not all, mammals, the normal position of the head of the rib was opposite the intervertebral space, and that as 12 ribs require 12 spaces, there must be 13 costal vertebræ. This additional thoracic or costal vertebra is provided by the 7, which is only (in man) deprived of its costal connection possibly by the traction of the subclavian artery, which is the remains of one of the primitive reptilöid branchial arches, even here the first rib is occasionally in its normal situation, and when it is found that, in all cases, there are in man eight and generally nine of the ribs in their normal situation, and, also, that an undue share is given to the 8th vertebra, as the whole of the 1st, and part of the 2d, rib is connected to it, we are surely authorised to consider this as the normal position in all mammals. The importance attached to this osteological discovery is, that it corrects an error in the universally assumed character of mammals, which Daubenton and Cuvier first applied, with the sole exception above noticed of the Sloth, which, however, still remains the exception to the number, while it corroborates the principle of coupling or pairing the cervical vertebræ, which is of considerable use in unravelling the cranial vertebræ, and which De Blainville speaks of as still unintelligible " to those who have been unable to elevate themselves to this kind of questions" (the signification of the skeleton transcendentally considered) " *partly* on account of the nature of their minds, and *partly* from the want of proper and sufficient subjects of contemplation."

In this view of the cervical vertebræ, there was no examination of what are known as floating or cervical ribs, first pointed out and described by Vicq d'Azyz in the Memoirs of the Academy of Paris for the year 1774, and which lately, Professor T. Bell of King's College, London, has described in the case of the Bradypus. This class of ribs ought to be regarded as quite different from the thoracic ribs; and there was a beautiful example exhibited on the table, which the kindness of Professor Goodsir enabled the author to shew to the Society, and which forms part of a series collected and described by Dr Knox, in the London Medical Gazette, some years ago. In various classes there are similar ribs, quite unconnected with, and differing from, the thoracic ribs, which are rather homotypes of the styloid process of the temporal bone, and possibly of the lower floating or the 10th, 11th, and 12th, or abdominal ribs. (?) The consideration of these, in the next part of the communication, with the exposition of the cranial vertebræ, will form a subject for a farther communication.

Having demonstrated that the 7th rib is attached to the 7th vertebra in the Mammal class, as in the Monkeys; the Carnivora, as far as examined; the Elephant, Hog, and Horse, among the Pachydermata; the Deer, Elk, Giraffe, Camel, Ox, Sheep, among the Ruminants; and the Dugong, Porpese, and Whale, among the Cetacea,—the only exception being the Seal and Walrus, in the specimens of the Barclay Museum of the Royal College of Surgeons of Edinburgh; and also having assigned a sufficient cause for the abnormal situation of the 1st rib in Man on the 8th vertebra, instead of between the 7th and 8th,—the enumeration of the cervical region will be 6 instead of 7, as hitherto described by all systematic naturalists, who depend on organic structure for the characters of their classification.

The following Donations to the Library were announced:—

An Attempt to discover some of the Laws which govern Animal Torpidity and Hibernation. By Peter A. Browne, LL.D. 8vo.—*By the Author.*

Cambridge and Dublin Mathematical Journal. Nos. 13 and 14. 8vo. —*By the Editor.*

Journal of the Asiatic Society of Bengal. No. 184. 8vo.—*By the Society.*

Journal of the Indian Archipelago and Eastern Seas. Nos. 1, 2, 3. 8vo.—*By the Editor.*

Guyot (A.) Note sur la distribution de Roches dans le Bassin Erratique du Rhone. 8vo.

—— Note sur le Bassin Erratique du Rhin. 8vo.

—— Note sur la Topographie des Alpes Pennines, &c. 8vo.—*By the Author.*

Monday, 6th March 1848.

THE VERY REV. PRINCIPAL LEE, V.P., in the Chair.

The Chairman, after a brief account of the Keith Foundation, presented to General Sir Thomas M. Brisbane, Bart., G.C.B., President of the Society, the Keith Prize Medal, awarded to him by the Council, for the Makerstoun Observations on Magnetic Phenomena, made at his expense, and published in the Transactions of the Society.

The Chairman also announced that the Council had also awarded, independently of the Keith Prize, a Silver Medal to J. A. Broun, Esq., in token of their sense of his merits, in conducting and superintending the Makerstoun Observations.

The following Communication was then read :—

On the Theory of the Parallel Roads of Lochaber. By James Thomson, Esq. jun., Glasgow. Communicated by Professor Forbes.

The author, after briefly stating the views of Mr Milne, and the remarks of Sir G. S. Mackenzie, gave his reasons for agreeing with the former, that the terraces were the beaches of lakes, formed by barriers across the valleys; and, with the latter, in holding that these barriers could not have been formed of earthy detritus. He then proceeded to shew that the theory of Agassiz, according to which the barriers were formed of glaciers, was the most probable yet advanced, and while it required some modification in the details to render it consistent with recently observed facts, was strongly supported by the researches of Professor Forbes, both in regard to the former existence of glaciers in our latitudes, as demonstrated in the case of the Cuchullin Hills, and in regard to the laws of the motion of glaciers, as developed in Professor Forbes's papers on the Glaciers of the Alps.

He pointed out that all the difficulties of the theory of earthy barriers were connected with the notion of their being composed of earthy detritus, and that both Sir T. D. Lauder and Mr Milne admitted the great difficulty of accounting for their disappearance.

He then explained the modifications which were required to render the theory of Agassiz capable of explaining all the facts hitherto observed.

The highest shelf in Glen Roy stops short just above the opening into Glen Glaster, and this would have been the result had the barrier which formed that shelf blocked up Glen Roy above the latter glen, and thus forced the water to be discharged by the water-shed at the head of the valley of the Spey. It must also have blocked up Glen Collarig nearly to the Gap. To form the middle shelf, this barrier had only to retire a little, so as to open up Glen Glaster, when the water would discharge itself by the ancient river-course leading from the water-shed in Glen Glaster, first pointed out by Mr Milne.

The lowest shelf would be formed when the glacier retired to near the mouth of Glen Spean.

The blockage of Glen Gluoy seems to have been unconnected with that of the other glens. The author ascribes it to a glacier occupying the site of Loch Lochy, and fed from the high mountain to the north. He explains the occurrence of a lower shelf in Glen Gluoy, which stops short of the mouth of the glen, by a reference to analogous phenomena observed by Professor Forbes in the Lac de Combal.

The shelf in a glen near Kilfinnan observed by Mr Darwin, is accounted for by the glacier supposed to have occupied the site of Loch Lochy.

Mr Milne objects, to the notion of a glacier descending from Ben-Nevis, and crossing Glen Spean to block up Glen Roy, that the inequalities of the intervening ground are so great as to render the existence of a glacier in this direction highly improbable, more especially as the ice had a comparatively easy outlet northward towards Fort-William.

The author, however, endeavours to shew, that, if we assume a climate intermediate between that which produces the glaciers of the Alps, and that which forms the glaciers of the arctic and antarctic regions, there is no real difficulty in imagining the existence of a great expanse of ice descending from Ben-Nevis, at a level considerably higher than that of the intervening hills, as well as of the highest shelf in Glen Roy.

That such a climate may very probably have existed, the author considers as proved by the researches of Professor Forbes among the Cuchullin Hills, the elevation of which is much less than that of Ben-Nevis.

There is, in the phenomena of the great erratic blocks of the Alps, proof of the former prodigious horizontal extension of glaciers, although, in the existing climate of the Alps, the glaciers no longer exhibit the same horizontal development. The author also referred to the indications of glaciers found in many parts of Great Britain, some of them in the Lochaber district, to the occurrence of organic remains of an arctic character, and to the marks of the supposed action of icebergs, as supporting the view of the existence of a glacial climate at some remote period.

The diluvial theory of Sir G. S. Mackenzie was briefly examined, and certain objections urged against it.

The author also alluded to the objection urged by Mr Lyell to the glacial theory, on the score of the changes of relative level on sea and land; and denied that there was any evidence of such changes having occurred since the termination of the supposed glacial period.

The paper was illustrated by a large map of the district of Lochaber, enlarged from that of Sir G. S. Mackenzie.

The following Gentlemen were duly admitted Ordinary Fellows:—

Dr James Allan, Deputy Inspector of Hospitals.
John Hall Maxwell, Esq. of Dargavel.
Thomas Stevenson, Esq., Civil Engineer.

The following Donations to the Library were announced:

Lalande's Catalogue of Stars. 8vo.
Lacaille's Catalogue of Stars. 8vo.—*By the British Association.*
The Journal of Agriculture, and Transactions of the Highland and Agricultural Society of Scotland. No. 20, March 1848. 8vo. —*By the Society.*

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